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Noninvasive Positive Pressure Mechanical Ventilation

NONINVASIVE MECHANICAL VENTILATION refers to the technique of supporting alveolar ventilation without the use of an artificial airway in the trachea. Although mechanical ventilation with endotracheal intubation is a successful means of providing ventilatory support, recent advances in the design of nasal and facial masks, together with the development of newer styles of ventilators, have widened the options available to patients with respiratory failure. Potential advantages to avoiding endotracheal tubes include improved comfort, preservation of speech and swallowing, decreased risk of infectious complications and decreased laryngeal injury. However, not all patients with respiratory failure are candidates for noninvasive techniques. Careful selection of patients and equipment is necessary for success.

A variety of types and sizes of nasal and facial masks are now available for use, allowing a comfortable fit for most patients. The mask should fit snugly, while avoiding excessive pressure on the skin; small air leaks around the mask are acceptable. Nasal masks permit speech, eating and expectoration without removal of the mask. However, patients in respiratory distress who mouth breathe may need a full face mask. Gastric distention is rarely a problem when the applied pressure is less than 25 cm H_2O. A nasogastric tube for gastric decompression need not be placed routinely.

Noninvasive positive pressure ventilation (NPPV) can be provided by standard volume-cycled or pressure-controlled ventilators or bilevel positive airway pressure ventilators (bilevel PAP). Advantages of standard ventilators include a broader range of ventilation capacity, the ability to deliver higher oxygen concentrations, and the presence of sophisticated monitoring devices and alarms. Pressure-support and pressure-controlled modes appear to be the most successful settings when used for NPPV. However, standard ventilators are expensive, complex and need a high-pressure gas source (50 psi), which limits their use outside the intensive care unit. For these reasons, bilevel PAP has become a popular means of delivering noninvasive ventilation. These less expensive machines cycle between different positive inspiratory and expiratory pressures, either in response to a patient's respiratory efforts, or at fixed rate set by the clinician. Disadvantages of the currently available bilevel PAP machines include their inability to provide high oxygen concentrations and limited monitoring and alarm capabilities.

NPPV appears to benefit over 50% of patients with acute respiratory failure who are cooperative, hemodynamically stable, not severely hypoxemic, can protect their airway and are able to tolerate a nasal or facial mask. Patients suffering from exacerbations of chronic obstructive pulmonary disease (COPD) appear particularly well-suited for NPPV, with studies suggesting a substantially decreased need for endotracheal intubation. Noninvasive ventilatory techniques have been very successful for many patients with chronic respiratory failure due to restrictive chest wall diseases, certain neuromuscular diseases and hypoventilation syndromes. Some patients with chronic hypercapnea due to COPD also appear to benefit. For many patients with chronic respiratory failure, intermittent NPPV, often for only a few hours each night, can improve daytime gas exchange. Possible reasons for the benefit in these patients include intermittent respiratory muscle rest, improvement of respiratory compliance by correction of microatelectasis, or resetting of the respiratory center's sensitivity to CO_2.

In summary, NPPV is a useful modality for selected patients with acute or chronic respiratory failure. This technique can provide ventilatory support while avoiding many of the disadvantages of endotracheal tubes and tracheotomies. However, time may be wasted if NPPV is begun in inappropriate patients rather than proceeding directly to mechanical ventilation using endotracheal intubation.

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Treatment of Gastroesophageal Reflux Disease—1998

THE GOALS OF THERAPY for gastroesophageal reflux disease (GERD) are to relieve symptoms, heal damaged esophageal mucosa, prevent complications, and maintain remission. Effective medical therapy can now achieve all of these goals in the vast majority of patients. Additionally, the introduction of laparoscopic fundoplication has renewed the interest in surgery as a way to achieve these goals, and is an option for patients who prefer an alternative to medication.

Most GERD patients have intermittent reflux symptoms, do not have significant esophagitis, and are unlikely to develop complications. For these patients lifestyle modifications such as dietary changes, elevation of the head of the bed, avoidance of early recum-

bency after meals, and discontinuation of smoking, alcohol and irritant medications may be the only therapy that is necessary. Antacids may be helpful, but they are neither effective nor cost-effective in patients with daily symptoms or significant endoscopic esophagitis.

For patients with more severe or more frequent symptoms of reflux, H2 receptor antagonists may be added to lifestyle modifications. Therapy for 6 to 12 weeks effectively relieves symptoms of reflux and heals esophagitis in about 50% of patients, and maintains remission in about 25% of patients. For severe esophagitis, it is generally more cost effective to add another agent or to switch to a proton pump inhibitor instead.

Promotility agents may also be used to manage GERD. Cisapride effectively relieves nocturnal heartburn in up to 50% of patients and is as effective as ranitidine in healing mild-to-moderate esophagitis. Metoclopramide may improve symptoms of reflux, but does not heal esophagitis, and should seldom be used because of its significant side effects.

Proton pump inhibitors are far more effective than H2 receptor antagonists at suppressing acid secretion. In patients with mild to moderate esophagitis, omeprazole or lansoprazole control GERD-related symptoms more effectively than H2 receptor antagonists and achieve healing rates of 80% to 100% within 8 weeks. Severe cases may require higher doses. Aggressive acid suppression with proton pump inhibitors also improves reflux-related dysphagia and may prevent or delay stricture formation. Significant side effects are uncommon. Most patients with significant esophagitis will relapse when therapy is discontinued, and maintenance therapy with proton pump inhibitors may be indicated. In a recent large prospective study highest remission rates were found in patients on combined omeprazole and cisapride (89%), followed by omeprazole (80%), ranitidine plus cisapride (66%), cisapride (54%) and finally, ranitidine (51%). Helicobacter pylori infection itself is not thought to be an important cause of GERD, and eradication of this infection, if present, is not necessary in the treatment of GERD.

Ironically, during the same time that proton pump inhibitors came into common use, surgery for GERD also increased due to the introduction of laparoscopic fundoplication. First performed in the early 1990s, the procedure is now commonly performed at many medical centers throughout the country.

Laparoscopic fundoplication closely approximates the procedure performed over many years by laparotomy or thoracotomy. Both a "complete" fundoplication, sometimes referred to as "Nissen fundoplication," as well as a "partial" fundoplication, may be performed laparoscopically. Partial fundoplications augment lower esophageal sphincter pressure less than complete fundoplications and may be preferred in patients with significant impairment of esophageal peristalsis. More complex operations, in which the length of the esophagus is augmented by dividing a portion of the stomach, may also be performed, but wide experience with these is lacking.

Patients being considered for surgery for GERD should undergo endoscopy with biopsies, 24 hour pH monitoring, and esophageal manometry. Endoscopy with biopsy is necessary to look for esophagitis or the premalignant condition of Barrett's esophagus. Biopsies should be performed because short segments of Barrett's esophagus may not always be grossly apparent. A 24 hr pH is performed to confirm that symptoms are caused by reflux of gastric contents and to document pathologic reflux in patients with atypical symptoms. Manometry is performed to assess esophageal motor function. Patients with impaired peristalsis are at increased risk for the development of dysphagia if a complete fundoplication is performed, and in these patients a partial fundoplication may be preferred. Occasionally, manometric findings may suggest an underlying collagen vascular disease (eg, scleroderma), and in some instances the manometric findings may contraindicate an antireflux operation. Some patients with early achalasia, for example, may complain of heartburn, and an antireflux procedure would be inappropriate. A barium swallow is expected by many, but not all surgeons, to assess the size of a hiatal hernia and to exclude anatomic surprises, such as diverticulae or esophageal shortening. Long term follow-up with laparoscopic fundoplications is not yet available, but it is reasonable to expect good or excellent results in 90% of patients at ten years.

Previous studies have demonstrated the superiority of antireflux surgery performed by laparotomy to that of medical management with H2 blockers. To date, however, there is no direct comparison of the results of laparoscopic fundoplications with proton pump inhibitors nor are there any good cost data to compare the two approaches. Indications for surgery, therefore, are not well defined. Complications of GERD are seldom fatal, and in most patients they may be prevented and symptoms much improved with medications. Indeed, symptoms that are not significantly improved by aggressive medical management may not actually be from gastroesophageal reflux, and may not be relieved by surgery. Most patients are referred for surgery because of their desire not to be medication-dependent. Long-term follow-up studies will be necessary to determine the role of laparoscopic surgery in the modern-day management of GERD.

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